14 January 1955

MEMORANDUM FOR: Mr. Amory

SUBJECT   : Soviet Mathematics

1. PROBLEM:

To use the lingua franca of science, mathematics, in the long-range estimation of scientific capability and as an indicator of intentions for intelligence purposes.

2. FACTS BEARING ON THE PROBLEM:

a. Mathematics is the lowest common denominator of the sciences. Scientific advance in whatever field one chooses requires mathematical investigation before research is started. The overlap or transition from one field of science to another is accommodated by mathematical functions.

b. The number of Soviet mathematical papers displayed an abrupt drop in 1938-39, two years before the entry of the USSR into the war. Obviously, mathematical research did not stop - only the publication of the results of that research stopped.

c. The principal Soviet mathematical journals are readily available and, from all present indications, will remain unrestricted in circulation.

3. DISCUSSION:

a. Applied mathematics is probably the best example of the old adage "necessity is the mother of invention." There is no known science for which some mathematical considerations are not precursors to intensive research.

b. Intensive study of Soviet mathematics could provide indication of future scientific capability and might also provide long-range indication of intentions.

c. Some of the predictions which mathematicians have made include:

(1) The Poincare (1900)-Lorentz (1904)-Einstein (1905)-Lewis (1908) relation between total energy (E) and mass (M),

$E=mc^2$ (c=the velocity of light), led to Enrico Fermi's work in 1922 and his prediction of the chain nuclear reaction.

(2) Implicit in Maxwell's equations was the prediction of electrical resonance, basic to radio.

(3) J. C. Adams and Leverrier almost simultaneously predicted the planet Neptune by mathematics.

(4) During the early days of World War II, there was remarkable emphasis on the mathematical theory of stochastic processes and the theory of random walk. The application to neutron diffusion and electronic emission theory was known to some and suspected by others.

(5) Other examples may be found in Tab A.

d. A study of Soviet mathematics journals could provide a quantitative and qualitative analysis of Soviet mathematical research. Such a study should correlate Soviet mathematical research with known significant applications in the Free World. (See Tab B for further argument).

e. A group of mathematicians having competence in theory of probability, differential equations, the calculus of finite differences, functional analysis and theory of special functions and an acquaintance with the applied aspects of the techniques could develop long-range estimates of potential scientific capability. (See Tab C for details of operation).

4. CONCLUSIONS:

a. Mathematics is a potent source of intelligence information which, if interpreted by skilled mathematicians, could provide advance warning of scientific development and could be a long-range indicator of intentions.

5. RECOMMENDATION:

That the AD/SI be directed, by indorsement of this staff study, to study the problem of the use of mathematics as a potential indicator of intentions and to submit for DD/I approval not later than 1 March 1955, a detailed plan for systematic surveillance of the Soviet mathematics literature for the purposes recited above.

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Assistant to DD/I (Planning)

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APPROVED

ROBERT AMORY, JR.
Deputy Director/Intelligence